

REMARKS

Claims 1-18 were pending in this application, though Claims 6, 7, 10, 11 and 16-18 have been withdrawn from consideration. Claims 1-5, 8, 9, and 12-15 have been rejected.

Applicants hereby affirm their previous telephonic election, with traverse, to prosecute Claims 1-15.

Applicants have amended the claims in an effort to more particularly define that which they regard as their invention. Applicants have also added new Claims 19 and 20. Support for these amendments and new claims are replete throughout the specification.

Claims 1-20 are pending, with Claims 1, 17 and 19 being independent.

Applicants' Response to the Section 112 Rejections

Claims 1-5, 8-9 and 12-15 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite.

Claim 1 has been amended to provide antecedent basis for Claims 3 and 4, as regards combinations of hydroxyalkylating agents.

Claims 2 and 9 have been amended to remove those members of the Markush groups that have no antecedent basis in their respective base claims. New Claims 19 and 20 have been

added to capture the removed members of the Markush groupings in independent form.

Claim 14 has been amended to provide a molar ratio instead of relative weight percents, support for which is replete throughout the specification, such as the examples section.

These amendments are believed to obviate the rejections as to Claims 2-4, 9 and 14.

As regards the rejections of Claims 1 and 8, Applicants traverse for the following reasons. Applicants use the "c", "t", "v" and "a" designations to define the condition that the relative amounts of the various contributing repeat fragments in the carboxylic acid functionalized polymer are fractional and when added to together realize 1, or 100%. These letter designations are each non-negative, rational numbers, the sum of which is 1. Thus, if a is 0, the carboxylic acid functionalized polymer is a polybutadiene; if $c+t+v$ is 0, the carboxylic acid functionalized polymer is a polyacrylonitrile.

Those persons of ordinary skill in the art will readily recognize that in a structural formula, such as the dicarboxylic acid functionalized polymer, the letter designations represent mole fractions, which can be normalized to a weight basis by dividing each sub-structural unit (as is

defined by paranthetical sub-structural unit preceding "c", "t", "v" and "a") by the molecular weight of the sub-structural unit.

Accordingly, in view of the above, Applicants respectfully request reconsideration and withdrawal of the Section 112 rejections.

Applicants' Response to
the Section 103 Rejections

Claims 1-15* stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 4,444,692 (Okamoto) in view of Examiner's Notice, further in view of U.S. Patent No. 4,266,046 (Wu) or T. Yoshino, "Synthetic Studies with Carbonates. Part 6. Syntheses of 2-Hydroxyethyl Derivatives by Reactions of Ethylene Carbonate with Carboxylic Acids or Heterocycles in the Precense of Tetraethylammonium Halides or under Autocatalytic Conditions", J.C.S. Perkin I, 1266-72 (1977). Applicants traverse this rejection.

For the sake of review, Applicant provides a brief description of the present invention for the Examiner's benefit.

The present invention is directed to a process for hydroxyalkylating carboxylic acid groups pendant on a butadiene and/or acrylonitrile polymer backbone. More specifically, this invention provides a process for preparing hydroxyl-functionalized materials by hydroxyalkylating dicarboxylic acid-

* In the Action, Claims 1-17 and 36-39 have been rejected under 35 U.S.C. 103(a), see paragraph 13. Applicants understand this to be a typographical error, and have responded accordingly.

functionalized polymers, using a hydroxyalkylating reagent, such as carbocyclic carbonates (e.g., ethylene carbonate), and/or a carbocyclic sulfites (e.g., ethylene sulfite).

The Action apparently uses two patent documents and a technical publication in support of the Section 103(a) rejections, each of which was brought to the Examiner's attention by Applicants in their July 8, 1999 Information Disclosure Statement, together with the Examiner's Notice that it is known that reactions using ethylene oxide are disadvantageous because of the toxic nature of the chemical, which is a gas.

Hydroxyl-terminated butadiene nitrile co-polymers ("HTBNs") have been manufactured commercially, one process for which is described in Okamoto. There, Okamoto claims a process for making such HTBNs from carboxylic acid-terminated butadiene nitriles ("CTBNs") using ethylene oxide. As the Examiner has noticed, ethylene oxide is a gaseous and hazardous material which is highly toxic and thus, at least for this reason, is undesirable as a reactant. Accordingly, different processes, particularly ones which did not employ the gaseous and highly toxic ethylene oxide and which achieve the desired result, would be viewed as desirable. Applicants have invented a process capable of manufacturing such HTBN's, as well as other hydroxylalkylated carboxylic acid-functionalized polymers. That process is described in the subject application, and defined by the pending claims.

The Action however has rejected the pending claims in view of Okamoto, using Wu and Yoshino to make up the acknowledged deficiencies of Okamoto as a reference against these claims.

Wu speaks to and claims a process for preparing esters of polycarboxylic acids which includes reacting cyclic carbonates with a polycarboxylic acid in the presence of an alkylammonium halide. The polycarbocyclic acids are exemplified as hydrocarbon radicals having from two to four carboxylic acid groups, and are selected from substituted aromatic acids, cyclohexyl acids and short chain acids. Wu describes the esters so formed as high molecular weight polyesters. In fact, at column 1, lines 59-62, Wu describes an object of his invention to be the provision of "an improved process for the esterification of carboxylic acids to high molecular weight polyesters." Such high molecular weight polyester materials are formed by condensation reactions.

Wu does not however describe a process for hydroxylalkylating a carboxylic acid functionalized polymer, particularly a dicarboxylic acid functionalized polymer. More specifically, Wu does not describe a process for reacting a cyclic carbonate with already formed carboxylic acid functionalized polymer to hydroxyalkylate the carboxylic acid functional groups; rather, Wu's process reacts a cyclic carbonate with a polycarboxylic acid to form bis(hydroxylalkyl)esters of polycarboxylic acids in high molecular weight. For instance, Example IV of Wu describes a polyester prepared by his process having four units of ethylene carbonate and three units from terephthalic acid.

Applicants' objective is to minimize the amount of reaction aside from the hydroxylakylation reaction on the two carboxylic acid functional groups that are pendant from the polymer backbone. By so doing, the molecular weight of the hydroxyalkylated polymer material should be substantially similar to the molecular weight of the starting dicarboxylic acid functionalized polymer material. See Specification, pages 26-27, Example 10 in which a molecular weight determination was made on commercial HTBN, compared with HTBN made in accordance with the present invention. Indeed, Applicants report that "good agreement" was found between the different sources HTBN, which is indicative of no appreciable resin extension as a result of the inventive process.

This is important because HTBNs react rapidly through their terminal hydroxyl groups with, for instance, organic diisocyanates to form solid, high molecular weight materials of low fusibility. They are also used in particular to form block prepolymer resins. Such low fusible materials and block prepolymer resins are constrained by the permissible molecular weights of their starting materials to achieve materials having appropriate physical properties.

Yoshino refers to the reaction of low molar mass compounds, such as monocarboxylic acids like acetic acid, decanoic acid, benzoic acid and derivatives thereof (e.g., p-methoxy, p-bromo, p-nitro, and 3,5-dinitro), with ethylene carbonate. These carboxylic acids are neither dicarboxylic acids, nor are they ordinarily polymerizable. Thus, the issue of

controlling the molecular weight of the hydroxylkylated final product is not presented.

Based on the cited documents of record, there simply is no teaching or suggestion therewithin to take Okamoto's process, and modify it to include the chemistry set forth in either of Wu and/or Yoshino. Moreover, in view of the discussion of these documents above, there would not even be motivation to look to the secondary documents, Wu and/or Yoshino, since Wu refers to a process for making polyesters through condensation reactions and Yoshino refers to the use of ethylene carbonate to react with low molar mass monocarboxylic acids. Neither preparation involves the hydroxyalkylation of dicarboxylic acid functionalized butadiene and/or acrylonitrile polymers.

To reach a conclusion of obviousness of the pending claims in view of the cited documents of record, could only have come about from using Applicants' invention as a template from which to pick and choose the appropriate pieces from the cited documents of record. Such a hindsight reconstruction of the present invention is impermissible under U.S. patent jurisprudence and must be avoided.

As such, reconsideration and withdrawal of the Section 103 rejections are respectfully requested.

Miscellaneous

Applicants have reviewed U.S. Patent No. 4,521,585 (Thomsen), cited of interest in paragraph 14 of the Action, and do not believe that it adds anything further to the documents

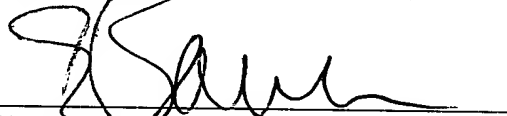
cited and relied upon in forming the Section 103(a) rejections in the Action.

CONCLUSION

Applicants respectfully submits that in view of the above, the subject application is in condition for allowance.

Applicants' undersigned attorney may now be reached by telephone at (860) 571-5001 or by facsimile at (860) 571-5028. All correspondence should now be directed to the address given below.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'S. Bauman', written over a horizontal line.

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